USER'S MANUAL

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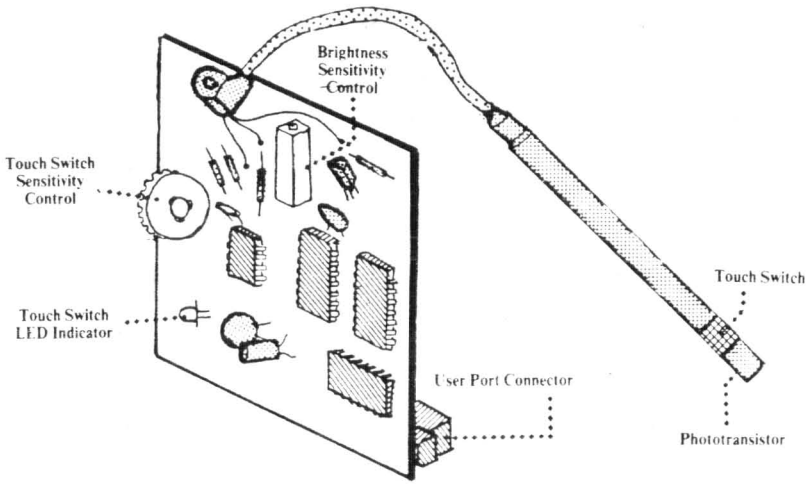
1. INTRODUCTION

The **Touch-N-Light Pen** is a valuable addition to your computer. It can be used to input information directly to the screen or read information from the screen without using the keyboard. This feature allows even very young users access to the computer. Before you try to use the Light Pen, read this manual to familiarize yourself with the setup and operation of the Light Pen.



2. INSTALLATION

The printed circuit board plugs into the user port located on the rear of the VIC. See page 149 of the VIC Computer Guide for the exact location of this input / output port. Make sure that the power to the VIC is off before you plug the printed circuit board in.

To use the Light Pen, touch it to a spot on the TV and touch the touch switch with a finger. Do not touch the touch switch if you do not want to activate the Light Pen.

3 ADJUSTMENTS / TESTING

Before the **Touch-N-Light Pen** can be used, two adjustments must be made: (1) the sensitivity of the touch switch must be adjusted; (2) the sensitivity of the phototransistor must be adjusted.

1. Adjusting the touch switch

a) Locate the touch switch on the Light Pen barrel. (See diagram.)

b) Locate the touch switch sensitivity control on the printed circuit board. (See diagram.)

c) Turn the touch switch sensitivity control clockwise until the touch switch LED indicator (see diagram) lights up.

d) Turn the touch switch sensitivity control counter clockwise until the LED indicator just goes off. Continue turning counter clockwise another quarter turn. Make sure that you are not touching the touch switch when you do this procedure.

e) With the LED indicator now off, touch the touch switch. The LED indicator should come on and remain on for as long as you remain touching the touch switch. The LED indicator is supposed to stay on for a fraction of a second after you release the touch switch.

f) If the touch switch does not work as described, go back to part 3.1.c and readjust. The touch switch was tested and found operable prior to shipment.

2. Adjusting the sensitivity of the phototransistor

The electronic circuitry requires that the phototransistor's output be within a very specific range. When a great amount of light triggers the phototransistor, it is possible to exceed this output range. Therefore, the brightness sensitivity control (BSC) is used to adjust the phototransistor's output.

a) Adjust the brightness of your TV set to its normal level.

b) With a small screwdriver, turn the BSC (see diagram) all the way counter clockwise.

c) Type in and run the following:

```
10 Poke 37138, 254
20 Print chr$(147)"x = "Peek(36870), "y = "Peek (36871),
"t = "Peek (37136)
30 goto 20
```

d) Touch the end of the Light Pen to the center of the TV screen and lightly touch and hold the touch switch. The numbers on the screen should be holding steady at about 60 and 60.

e) Slowly move the Light Pen vertically. The "y" value only should change as you move the Pen up and down. If it does not change, slowly turn the BSC and check to see if the Light Pen responds properly. After the "y" number is adjusted, move the Pen horizontally to change the "x" values. A few turns on the BSC is all that is necessary to adjust the "x" value.

f) Move the Light Pen around the screen and make sure that every location returns a different set of numbers. This setup routine only has to be done once; so take your time and be as accurate as possible.

g) The "t" value should be 1 when the touch switch is touched and 0 when it is not touched. If "t" = 0, then the output of the Light Pen is disconnected from the VIC.

4. THE DEMONSTRATION PROGRAM

The demonstration program can now be loaded in the normal manner. The program contains instructions for its use.

Since the VIC cassette unit is not as reliable as it should be, the program is recorded twice on the tape. If the program does not load properly the first time, try to load the second program. Some people suggest turning the cassette player upside-down if problems occur during a load.

To make this program fit into an unexpanded VIC, the program was "crunched" drastically. Unless you are an advanced programmer, do not attempt to understand the program.

5. THEORY OF OPERATION

The VIC was specifically designed to support a Light Pen. The Video Interface Chip shares this responsibility along with the 6502 CPU. Among the functions these circuits provide is controlling and tracking the electronic beam that continuously crosses the TV screen — from left to right and top to bottom — covering the whole screen 60 times each second. This speed is faster than the eye can detect, but slow enough so that the Video Interface Chip can keep track of the beam's location as it moves through every pixel (dot) on the screen.

As the electronic beam moves around the screen and the Light Pen senses the light from the beam, the Video Interface Chip "memorizes" the location of the pen at that exact moment and stores its position in two memory locations: 36870 and 36871. The first memory location stores the horizontal position; the second stores the vertical position. If you retype the short program above, you will notice some important facts:

a) The value of "x" will vary from about 34 on the left hand side of the screen to about 122 on the right. The "y" value will vary from 20 at the top to about 112 at the bottom. These are only approximate, and slight deviations from these numbers are nothing to worry about. Note, however, that there are 88 "x" values (4 for each screen column) and 92 "y" values (4 for each screen row).

b) The Light Pen is very sensitive and is subject to "noise" — unwanted signals. Hold the Pen still and the values might change by themselves. This is "noise" and must be compensated for in programming.

c) The last thing to remember is that the Light Pen always remembers and stores the last value of "x" and "y." If you remove the Pen from the screen, the values of "x" and "y" will remain at their last reading. This, too, must be compensated for in programming.

There is another option which can be implemented when using the Light Pen. The touch switch output line can be directly read by the VIC through the user port, even when the Light Pen is not being used to receive information from the screen.

The data direction register must first be set to input mode by poking 37138 with 254 (see part 3.2.c above). Memory location 37136 will then contain a 0 when the touch switch is not activated and a 1 when the touch switch is activated. This is useful for having the VIC "wait" for an appropriate user input. For example, the following program will "wait" at line 100 until the touch switch is touched.

```
 90 Poke 37138, 254
100 if peek (37136) = 0 then 100
110 print "You touched the
    touch switch."
```

6. WRITING YOUR OWN PROGRAMS

It is very easy to incorporate the Light Pen into a new or existing program. You must first determine exactly what you want the Light Pen to do — input information from the screen to the computer or output information to the screen.

Program 1 tells the user where the Light Pen is pointing. A program like this is used to read information from the screen in multiple choice questions, menu selections, music composition, etc.

Program 2 puts information on the screen according to where the Pen is pointed. It can be used to draw on the screen, play games, move shapes, etc. Both of these short programs are just to demonstrate the two modes of Light Pen usage.

PROGRAM 1

```
20 POKE37138, 254                    : REM - DATA DIRECTION REGISTER
30 IFPEEK(37136) = 0 THEN 30         : REM - WAIT FOR TOUCH SWITCH
40 X% = (PEEK (36870) - 34)/4        : REM - SCALE / LOCATE COLUMN
50 PRINT "COLUMN" X %
60 Y % = (PEEK(36871) - 22) / 4      : REM - SCALE / LOCATE ROW
70 PRINT "ROW" Y %
80 FORX = 1 TO 500 : NEXT            : REM - PAUSE
90 PRINT CHR$(147):GOTO 30           : REM - CLEAR SCREEN / REPEAT
```

PROGRAM 2

```
10 X$ ="[21 CURSOR RIGHTS]"          : REM - 21 CURSOR RIGHT
15 Y$="[22 CURSOR DOWNS]"            : REM - 22 CURSOR DOWN
20 POKE 37138, 254                   : REM - DATA DIRECTION REGISTER
30 IFPEEK (37136) = 0THEN30          : REM - WAIT FOR TOUCH SWITCH
40 X % = (PEEK(36870 - 34)/4         : REM - SCALE / LOCATE COLUMN
50 Y % = (PEEK(36871) - 22) / 4      : REM - SCALE / LOCATE ROW
55 Z$ = LEFT$(X$, X%) + LEFT$(Y$,Y%) : REM - POSITION ON SCREEN
60 PRINT CHR$ (147) Z$"X"            : REM - PRINT "X"
80 FORX = 1TO500 : NEXT              : REM - PAUSE
90 PRINT CHR$(147):GOTO30            : REM - CLEAR SCREEN / REPEAT
```

7. OTHER INFORMATION

a) The **Touch - N - Light Pen** was tested on a VIC before shipment and was in working order. If after following the above instructions the **Touch - N - Light Pen** does not operate properly, it can be due to a poor raster scan on your TV. Try the Pen on another TV and see if operation is normal. If the Pen still does not work, return it to ***Sunshine Peripherals*** for an exchange. If the Pen works on the other TV, then your TV is defective, though slightly, and should be repaired.

b) The printed circuit board should be handled carefully. It is an electronic instrument and should not be subject to any extremes of temperature, moisture, or shock. Therefore, try not to insert and remove the printed circuit board too many times.

c) The information contained herein has been carefully checked and is believed to be correct. ***Sunshine Peripherals***, however, assumes no responsibility for inaccuracies or omissions. ***Sunshine Peripherals*** will not be liable for any incidental or consequential damages arising from any misuse of the product.

d) ***Sunshine Peripherals*** warrants, for a period of thirty (30) days from date of purchase, that the **Touch - N - Light Pen** is free from defects in workmanship and materials under normal use, provided that equipment is used in accordance with the information presented in the User's Manual. This warranty shall be void if the product is modified or tampered with in any way. If any failure occurs during the warranty period, ***Sunshine Peripherals*** will correct the defect, either by suitable repair or replacement, at our option and at our expense, if you return the product to: ***Sunshine Peripherals, 1229 East 28th Street, Brooklyn, New York 11210.*** This limited warranty does not apply if the **Touch - N - Light Pen** is used for commercial purposes.

VIC IS A REGISTERED TRADEMARK OF **Commodore Business Machines**

Touch - N - Light IS A TRADEMARK OF ***Sunshine Peripherals***

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